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Title

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Permalink

https://escholarship.org/uc/item/1pz8m8q2

ISBN

9783030189105

Authors

Trachtman, C
Van Dop, M
Villas-Boas, S

Publication Date

2019

DOI

10.1007/978-3-030-18911-2_25

Peer reviewed

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Understanding the Influence of Brand Information in Online Purchase Decisions for Health Products

Carly Trachtman, Molly Van Dop, and Sofia Villas-Boas

Department of Agricultural and Resource Economics, University of California, Berkeley

ctrachtman@berkeley.edu, molly_vandop@berkeley.edu, sberto@berkeley.edu

Abstract. In 2016, over 6% of all retail spending at health and personal care firms was done through an electronic medium. Purchasing health products online provides an interesting challenge to consumers, as not only do consumers often have limited knowledge about which health goods that will best suit their needs (as these tend to be experience goods bought infrequently), but they also face the additional challenge of having to discern the quality of a good only based on its online listing. Hence in this context, a signal, such as the brand information of a good, may be useful in identifying its quality. Additionally, given that online purchasing decisions occur in private, we can rule out some other explanations for consumers choosing branded products, such as reputational concerns. Using data from a health goods retailer operating through Amazon.com from 2013 and 2014, we test whether brand information in the product's listing influences the demand for health-related goods. We find that having branded information displayed in the product's listing photo significantly increases the probability consumers consider a health good in their choice set (measured as page views) but not the demand for the goods, except for the case of bandages and dressings.

Keywords. Brands; Brand equity; Health products; Experience goods.

1 Introduction and Research Question

Economists have long recognized the asymmetric information problem faced by consumers when buying goods for which they have imperfect information about the quality (see Akerlof 1970; Nelson 1970; and Wolinsky 1995). This issue is especially salient in the case of experience goods, for which consumers cannot

ascertain information about quality until after they purchase the good (Nelson 1970). One such category of experience goods for which consumers may face a particular challenge in assessing pre-purchase quality are health-related goods. Most consumers buy these types of goods very infrequently and have limited information about how to assess the quality of such a good without expert medical advice. Hence, we may think it unlikely that consumers would choose to buy health goods online, where consumers often receive limited signals of product quality, as they cannot observe the physical product itself. Additionally, while in some retail settings an expert, such as a pharmacist, may be able to aid the consumer in choosing the good that best serves their needs, online shopping decisions are made in private. Instead consumers rely only on product listing information.[1] Yet despite this, in 2016, over 6% of all retail spending at US health firms was done on an electronic medium, such as an online selling platform (US Census Bureau 2018).

What information then do consumers use when shopping for health goods online to assess the quality of a good? There is evidence that consumers have a preference for familiarly branded products when purchasing health goods; Bronnenberg, Dube, Gentzgow, and Shapiro (2015) find that consumers are more likely to purchase branded over-the-counter drugs than health experts are. Consumers may prefer branded products for many reasons, including the social "status" that is conferred when using a specific brand and "social utility" of using a similar product as a peer. Yet as the decisions in question are made in private and are not of the type likely to confer much status, it seems unlikely that these are driving factors in consumers preferring branded health products. Instead, we would suppose that consumers may view brands as a signal about quality; choosing a product from a brand in which a consumer is familiar or appears to the consumer to be "legitimate" may reduce the uncertainty about the quality of a health good, especially in an online marketplace for which there is a high variance in the quality of goods sold (Wernerfelt 1988; Erdem and Swait 2004). Indeed, Carrera and Villas-Boas (2016) find in a retail setting that a labelling intervention in which consumers are assured of the quality of the product (by providing information about how many

[1] Sometimes consumers also can receive information on product quality online through reviews left by other consumers. However, these too can be a noisy signal, as it is unclear who the reviewers are. Especially for the case of health-related goods, it is also unclear if products that best serve one consumer may also best serve another consumer.

other shoppers choose the generic brand) increases demand for generic OTC drugs.

In this paper, we explore the question of how brand information affects what health goods consumers consider as part of their choice set (measured in this context by which products' pages they view) and their purchasing decisions for health goods in an online context. We use a panel data set consisting of observational data of all purchases made for a health goods seller on Amazon.com between January 2013 and March 2014. We consider two measures of brand information: whether the product has the brand name in its listing title and whether the brand name appears prominently in photos of the product included in the product listing. We find that branded information significantly increases the number of consumers who consider a given good as part of their choice set, but ultimately does not significantly increase demand for the good, except for the case of bandages and dressings. Practically, this implies that for managers of firms selling health goods for which consumers have limited quality information, brand information can provide reassurance of quality, putting the good on a consumer's "radar."

2 Data

The data set used comes from a medium-sized seller operating through the Amazon.com retail platform selling health-related goods. It contains information on all product prices, quantities sold, and profits for each individual item sold for all months between January 2013 and March 2014. Average monthly seller's revenues and profits over this period were $109,900 and $17,240 respectively. Over this period, the company sold at least one unit of 2,316 unique products (as defined by their "Child ASIN," which is how Amazon.com identifies individual products). In total, there are 7,961 product by month observations.[2] The products this seller offers include a variety of health-related goods, including braces and splints, bandages and dressings, compression socks and other diabetes care items, medical creams and ointments, and other medical equipment. However, to be able to perform analysis of the branded characteristics of the product listing (to

[2] We only observe a product in a given month if a positive quantity in that month was sold (except for one observation of 0 sold, which we drop). We cannot differentiate in our current data if a product was simply not offered in a given month or if it was offered but not purchased.

identify if the brand was listed on the product/in the picture), additional information about the product listing had to be collected. This was done by the authors between December 2018 and January 2019. As not all of the products were still being sold on Amazon.com, this reduced our sample size to the 4,876 product by month observations we were able to match for 1,372 unique products.[3] Summary statistics are listed in Table 1 below.

Variable	*N*	*Mean*	*Std. Dev.*	*Median*	*Min.*	*Max.*
Retail Price	4,876	$27.90	$31.37	$18.62	$0.19	$492.80
Unit Profit	4,876	$6.29	$9.82	$3.37	-$47.60	$135.80
Units Sold	4,876	7.90	24.26	2.00	1.00	589.00
Wholesale Price	4,876	$17.97	$20.78	$11.45	$0.00	$312.00
Page Views	4,876	848.20	5,287.83	77.00	0.00	193,000.00
% with Brand in Title	4,876	75.33%	43.11%	100.00%	0.00%	100.00%
% with Brand in Picture	4,876	54.82%	49.77%	100.00%	0.00%	100.00%

Notes: All observations are at the product by month level. Retail price is calculated by adding the wholesale price, the profits, and Amazon's commission (this does not include shipping costs). The observations of "0" page views can be explained by the intricacies of Amazon; sometimes a product can be purchased from another product's page.

Table 1: Summary Statistics of Variables Used in the Analysis

[3] This surely may introduce some selection issues (overall more demanded and perhaps higher quality products are likely to still be sold), and it is also possible that the product listings have changed over time. Yet, these issues would likely bias us against finding significant results.

3 Empirical Strategy and Results

We consider two questions in our analysis; first, whether branded information influences the number of consumers that consider a good as part of their choice set and second whether branded information influences the demand for the good. We take each separately. First, in order to see the influence of branded information on the number of page views a given good has (which is a proxy for whether consumers consider a good as part of their choice set in their purchase of a health good), we run the following regression specification:

$$Pageviews_{it} = \alpha_1 Brand_{it} + \tau_t + \varepsilon_{it} \qquad (1)$$

where i indexes good and t indexes month, $Pageviews_{it}$ denotes the number of views the webpage of good receives, τ_t is a time fixed effect, and $Brand_{it}$ is a vector of branding indicators, including some combination of: $Brandname_{it}$ which denotes whether there is a brand name listed in the title (that corresponds to the brand of the product as denoted by Amazon.com's listing), $Brandpic_{it}$ which denotes whether at least one of the product listing's photos has a brand name prominently displayed, and interaction of the two.[4] The results are in Table 2. We find that simultaneously having both a brand name in the title and in the picture garners an additional significant 1,238 page views a month.

Variable	*(1)*	*(2)*	*(3)*	*(4)*
Brand Picture	828.308***		782.442***	-147.703
	(152.227)		(152.852)	(305.496)
Brand in Title		622.212***	532.922***	-75.240
		(175.602)	(176.015)	(246.662)
Brand Pic*Brand Title				1237.749***
				(352.119)
Monthly FE	Yes	Yes	Yes	Yes
N	4,876	4,876	4,876	4,876
R-Squared	0.0084	0.0049	0.0102	0.0127

Note: *** denotes significance at the 99% level, ** denotes significance at the 95% level, and * denotes significance at the 90% level.

Table 2: Influence of Branding on Page Views

[4] Our optimal brand variables would include information how well known the brand is, but development of such a measure is beyond the scope of this paper.

Next, in order to determine the effect of branded information on online purchase demand for health goods, our goal is to estimate the effect that branded product information has on the quantity demanded. However, in simply regressing quantity purchased on price and brand information we come across the standard econometric system of equations issue, where it is ambiguous as to whether we are estimating a supply or demand relationship. To get around this, we run a two stage least squares (2SLS) procedure, where we instrument the listed retail price of the good with the wholesale price of the good. This instrument captures information about the supply curve. In other words, we use supply side driven variation in prices (supply side cost shifts in wholesale prices) to identify the slope of the demand curve.

Hence we run the following first stage:

$$Retailprice_{it} = \beta_1 Wholesale_{it} + \beta_2 Shipping_{it} + \beta_3 Pageviews_{it} + \beta_4 Brand_i + \tau_t + \omega_i + \varepsilon_{it} \quad (2)$$

where $Retailprice_{it}$ denotes the purchase price the consumer faces outside of the shipping costs[5], $Wholesale_{it}$ is the wholesale price that the seller pays for the product, $Shipping_{it}$ is the shipping cost that the seller faces, and $Pageviews_{it}$ and $Brand_{it}$ are the same as above. Monthly and product fixed effects are denoted by τ_t and ϵ_i, respectively. Note that besides just being the first stage in our estimation of demand, this regression also describes how the supplier's costs are passed through to the final retail price. The results can be seen in Table 3. In all of our specifications, the wholesale price has a positive association with the retail price, which suggests that there is a significant amount of pass-through to consumers. Additionally, we see that the brand being visible in the product photo is associated with a higher retail price.

Variable	*(1)*	*(2)*	*(3)*	*(4)*
Wholesale	0.267***	0.337***	0.266***	0.276***
Price	(0.0608)	(0.0599)	(0.0609)	(0.0606)
Shipping	-0.926***	-0.844***	-0.927***	-0.907***

[5] We do not include the shipping cost in the retail price as there is evidence that consumers consider "shrouded" attributes like shipping costs the same way as they do price when making online shopping decisions. See Hossain and Morgan (2006). We also assume shipping costs faced by sellers are exactly the shipping price charged to consumers, as we only have information on the former.

Cost	(0.211)	(0.212)	(0.211)	(0.212)
Page views	0.0000287	0.0000299	0.0000287	0.0000295
	(0.0000224)	(0.0000225)	(0.0000224)	(0.0000223)
Brand in Picture	15.807***		15.899***	19.312***
	(2.750)		(2.807)	(4.822)
Brand in Name		-2.816	0.476	2.689
		(2.861)	(2.906)	(3.845)
Brand Pic* Brand Name				-5.204
				(5.856)
Product FE	Yes	Yes	Yes	Yes
Monthly FE	Yes	Yes	Yes	Yes
N	4,876	4,876	4,876	4,876
Adj R-Squared	0.9770	0.9763	0.9770	0.9770

Note: *** denotes significance at the 99% level, ** denotes significance at the 95% level, and * denotes significance at the 90% level

Table 3: First Stage: Passthrough

Next, we look at demand. Given the strong relationship between the wholesale price faced by the Amazon seller and the listed price for the consumer, we will use the wholesale price as an instrument in estimating demand. We estimate demand with the specification:

$$Quantitysold_{it} = \gamma_1 \widehat{Retailprice}_{it} + \gamma_2 Shipping_{it} + \gamma_3 Pageviews_{it} + \gamma_4 Brand_i + \tau_t + \omega_i + \varepsilon \quad (3)$$

where $Quantitysold_{it}$ are the number of units ordered by product and month, $\widehat{Retailprice}_{it}$ are the fitted values from the first stage, and all over variables are as before. The results are in Table 4. Page views seem to have a significant positive relationship with the quantity demanded, but brand indicators do not. Notably, the coefficients on retail price are not (significantly) negative in any of the regressions. This could reflect that fact that while consumers generally dislike higher prices, in the context of health goods, price might also be an important quality signal.

Variable	*IV (1)*	*IV (2)*	*IV (3)*	*IV (4)*
Retail Price	0.166	0.122	0.154	0.155
	(1.015)	(0.813)	(1.018)	(1.020)

Shipping Cost	-1.356	-1.418	-1.375	-1.383
	(1.259)	(1.096)	(1.264)	(1.256)
Pageviews	0.000720***	0.000721***	0.000720***	0.000720***
	(0.000108)	(0.000106)	(0.000108)	(0.000108)
Brand in Picture	-4.048		-3.363	-4.719
	(22.275)		(22.648)	(31.587)
Brand in Product Title		3.219	2.609	1.739
		(13.218)	(13.463)	(18.190)
Brand Pic* Brand Title				2.009
				(27.736)
Product FE	Yes	Yes	Yes	Yes
Monthly FE	Yes	Yes	Yes	Yes
N	4,876	4,876	4,876	4,876
R-Squared	0.0093	0.0226	0.0131	0.0140

Note: *** denotes significance at the 99% level, ** denotes significance at the 95% level, and * denotes significance at the 90% level

Table 4: Demand

3.1 Effects of Brand Information by Product Category

Next, we break down this framework by product category. We developed these product categories based on those developed by Amazon. The product categories include: Compression Socks and Medical Support Hose, Arm, Hand & Foot Supports, Leg & Foot Supports, Bandages & Dressings, Lumbar Supports & Pillows, and Ointments & Cleansers. To conserve space, we will just show the results of the second stage regressions of demand curves, yet the procedures are the same as what is described above (in the Column 3 specification), except that we omit the product fixed effects and instead use the sub-samples of goods that apply to each category. The results are below in Tables 5a and 5b. We find that page views show a positive relationship with the quantity demanded as above. In addition, in the compression socks and bandages categories, the retail price is negatively associated with quantity demanded (as is traditionally the case

with a demand curve, perhaps because consumers are able to better discern quality with these goods and do not use price as a quality signal to the same extent). Finally, in the bandages category, we see that having the brand pictured has a positive association with the quantity demanded.

Variable	*Socks* *(1)*	*Arm* *(2)*	*Leg* *(3)*
Retail Price	-0.0517***	-0.0187	-0.00835
	(0.0158)	(0.0286)	(0.0093)
Shipping	0.872	-0.765**	-0.0924
Cost	(0.870)	(0.375)	(0.1753)
Pageviews	0.00862***	0.0115***	-0.004***
	(0.000991)	(0.000714)	(0.0003)
Brand in	0.780	-0.380	-1.003
Picture	(0.585)	(0.650)	(0.917)
Monthly FE	Yes	Yes	Yes
N	831	471	858
R-Squared	0.2632	0.4319	0.2631

Table 5a: Demand, by Product Category: Compression Socks; Arm, Hand & Finger Supports; Leg & Foot Supports

Variable	*Bandages* *(4)*	*Lumbar* *(5)*	*Ointments* *(6)*
Retail Price	-.10***	-.00830	0.0232
	(0.0371)	(0.0076)	(0.535)
Shipping	0.263*	0.0215	-1.498**
Cost	(0.136)	(0.0198)	(0.699)
Pageviews	0.0064***	0.00186***	0.000396
	(0.0009)	(0.000692)	(0.0006946)
Brand in	3.177**	0.292	-2.350
Picture	(1.235)	(0.575)	(3.147)
Monthly FE	Yes	Yes	Yes
N	222	157	233
R-Squared	0.3708	0.1276	0.1743

Note: *** denotes significance at the 99% level, ** denotes significance at the 95% level, and * denotes significance at the 90% level

Table 5b: Demand, by Product Category: Bandages & Dressings; Lumbar Support and Pillows; Ointments and Skin Treatments

4 Discussion

Overall, our results indicate that having the brand listed in the title of the product and in the product photo has a significant positive correlation with the number of page views a product gets in a month, which is a proxy for the number of consumers that consider a given good as part of their choice set. However, after controlling for the number of page views, we have little evidence that branded information for a product has a direct impact on the quantity demanded, except when considering the category of bandages and dressings separately. Given the limitations of our data, this is not particularly surprising. However, this work provides suggestive evidence that future research with more complete data may find a relationship between branded information and quantity demanded. Moreover, this work still implies that it could be beneficial for managers of firms selling health goods to add brand information to their listings. First, having a product page viewed mechanically increases the probability it will be purchased. Second, when consumers view pages, it increases their information about the brand and the seller, such that they may feel more comfortable purchasing products from that brand and seller in the future. Additionally, given Amazon's search results algorithm, more page views today can result in products appearing earlier in search results in the future, which could increase product sales in the future.

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